

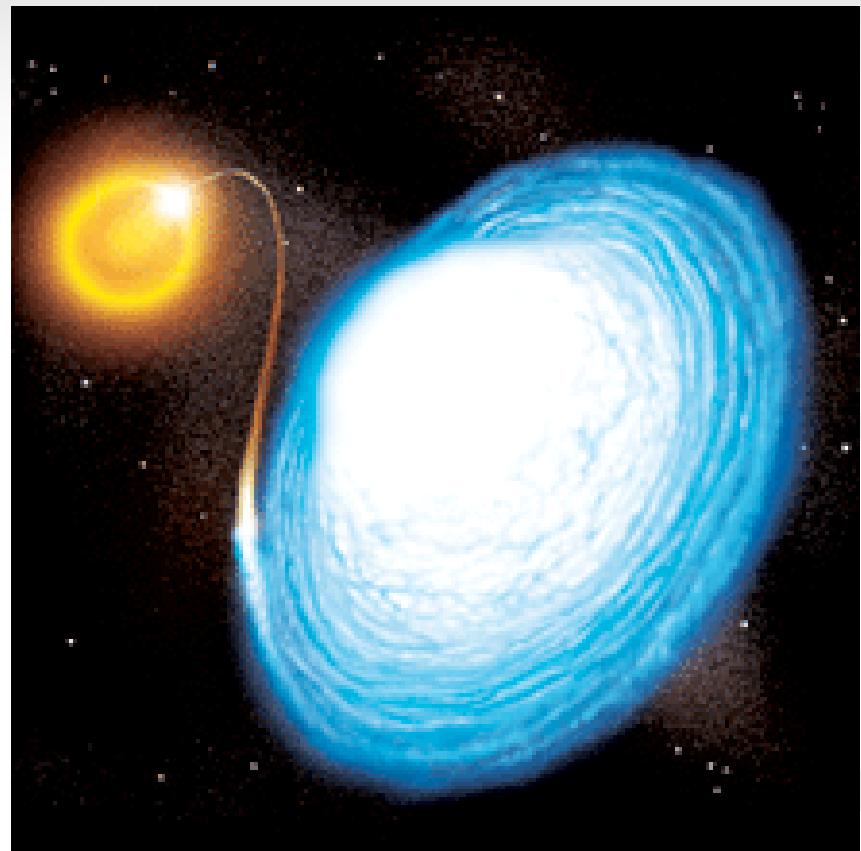
Proton-decaying states in ^{22}Mg and the nucleosynthesis of ^{22}Na in novae

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KVI, Groningen and
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Novae

- Thermonuclear runaway at base of accreted envelope on white dwarf in close binary system
- Radiative wind drives envelope off surface: contributes to galactic nucleosynthesis
- Energetics, ejecta abundances and masses predicted by models



Gamma rays from novae

- ^{22}Na : 1.275 MeV ☐
- None detected from galactic novae by NASA's CGRO
- ESA's Integral launched in October
- Test abundance predictions of thermonuclear runaway models

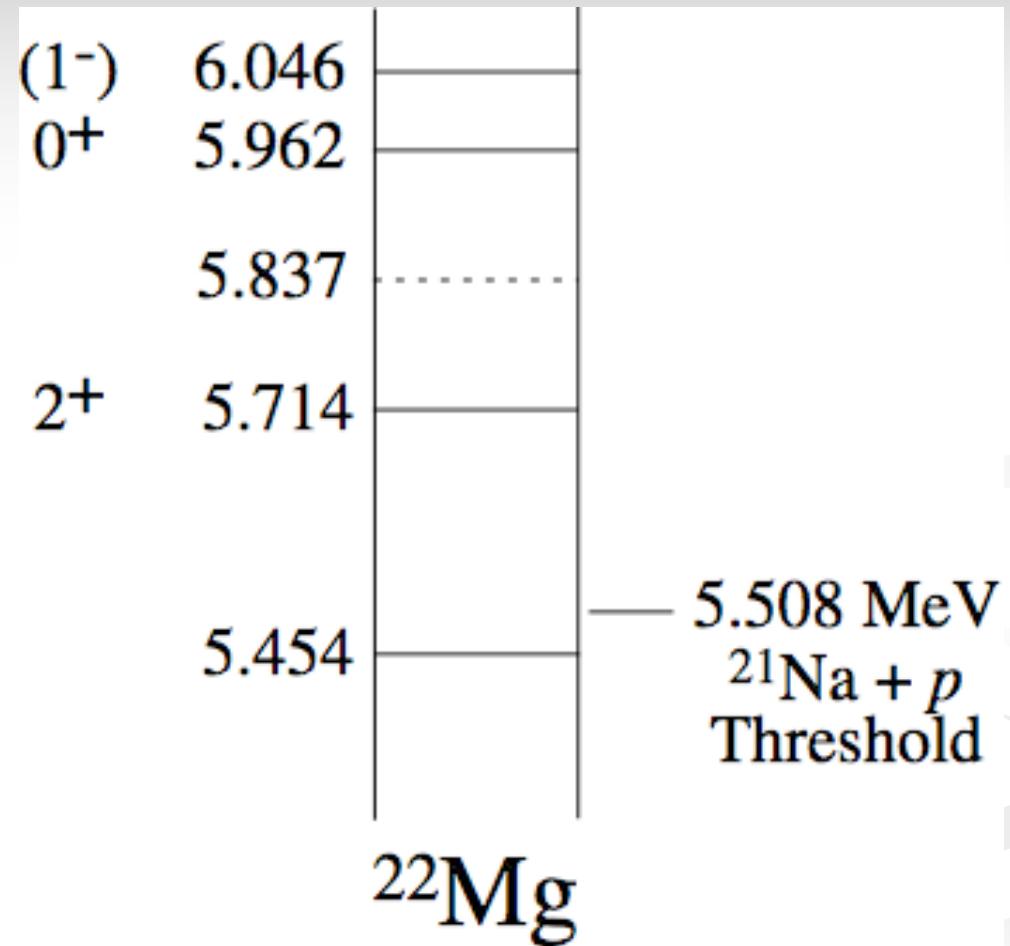


^{22}Na production in novae

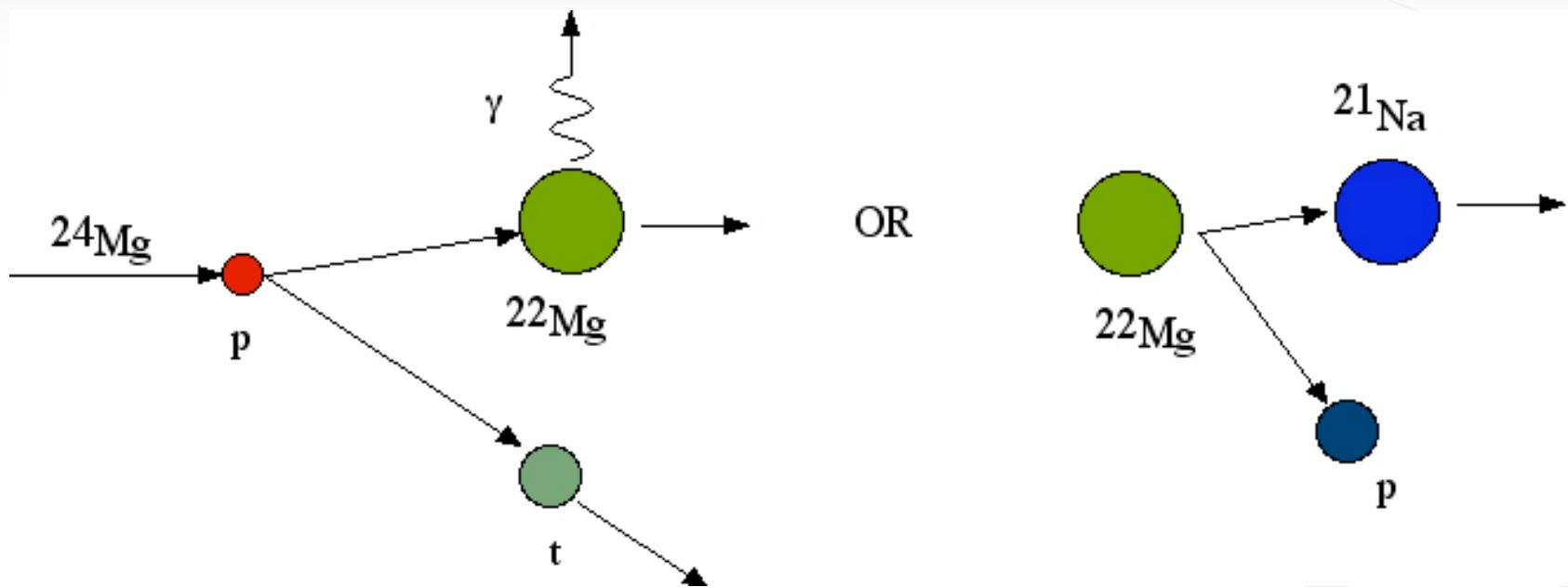
- $^{21}\text{Na}(\gamma+)^{21}\text{Ne}(\text{p},\gamma)^{22}\text{Na}$
- $^{21}\text{Na}(\text{p},\gamma)^{22}\text{Mg}(\gamma+)^{22}\text{Na}$



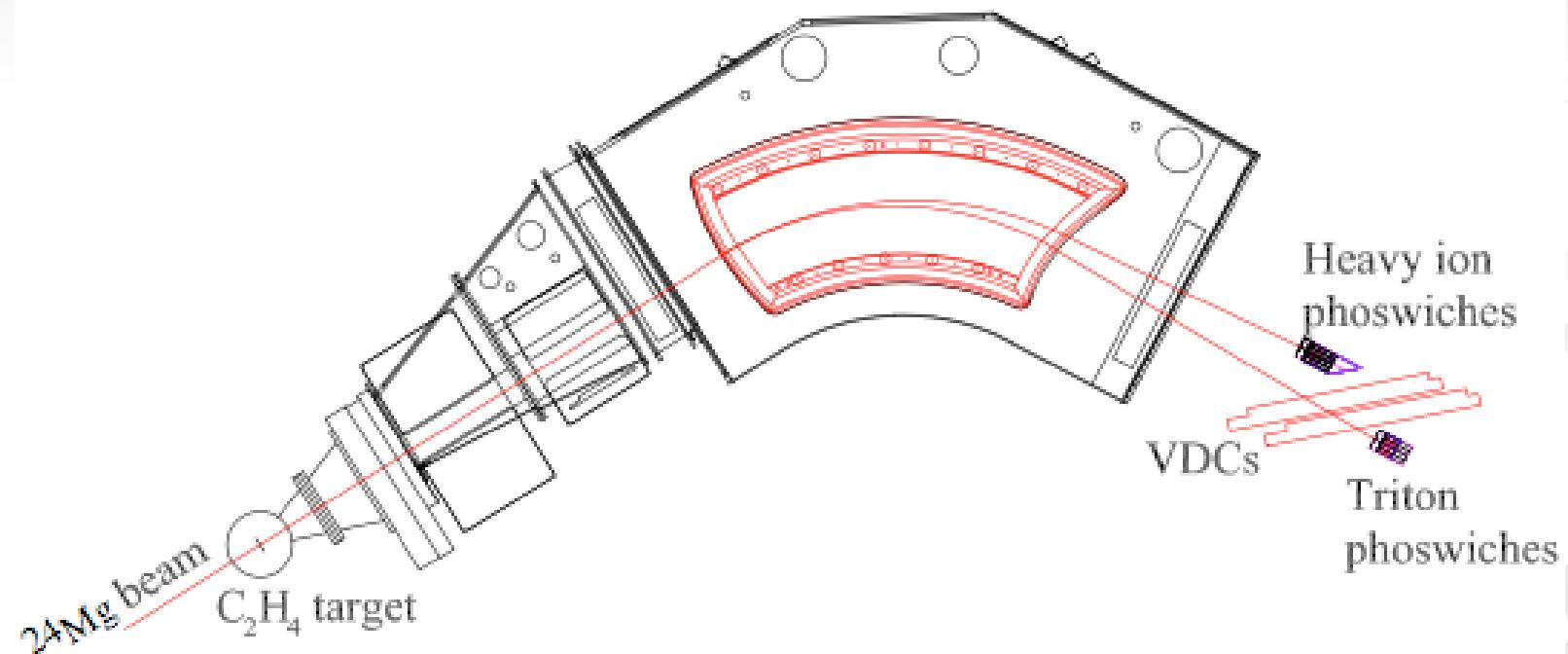
^{22}Mg level scheme



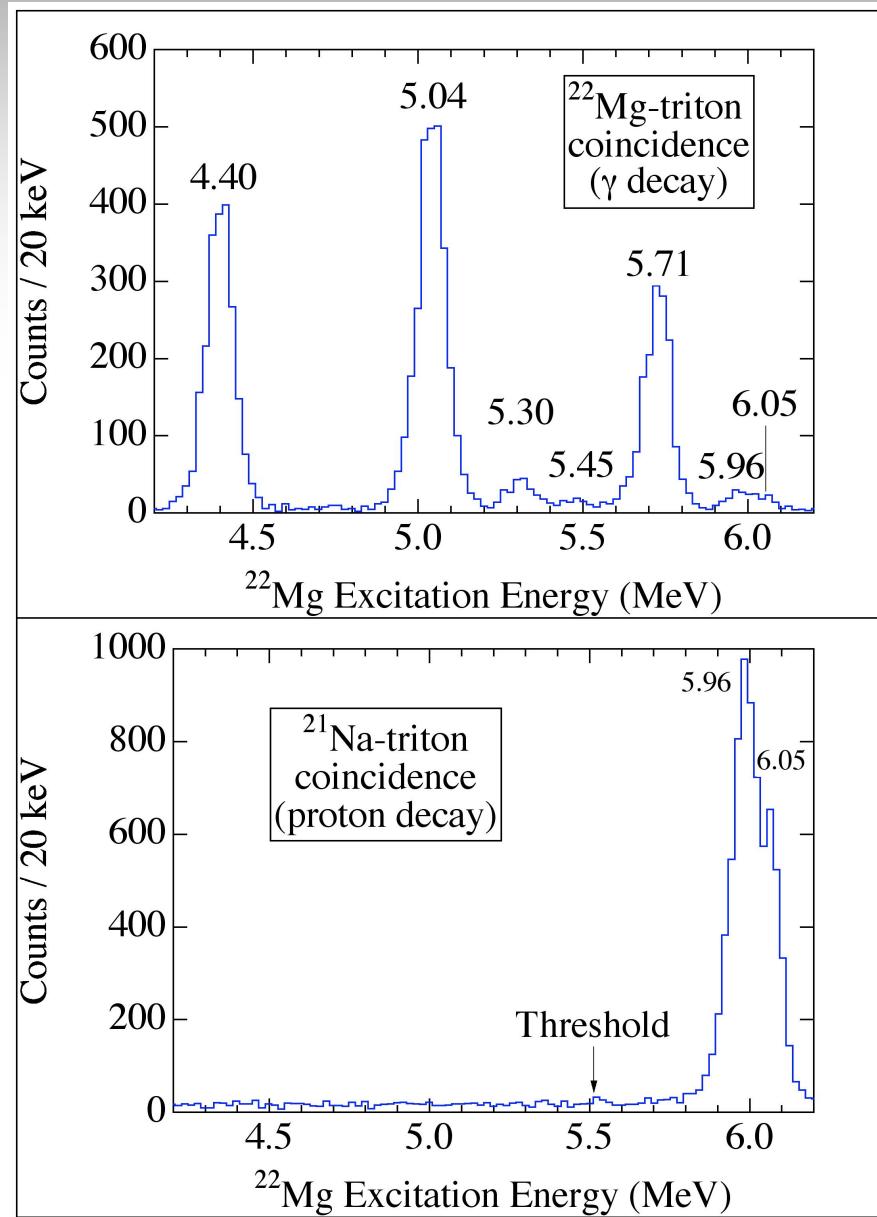
Technique: proton-decay branching ratio measurement



Experimental setup at the KVI



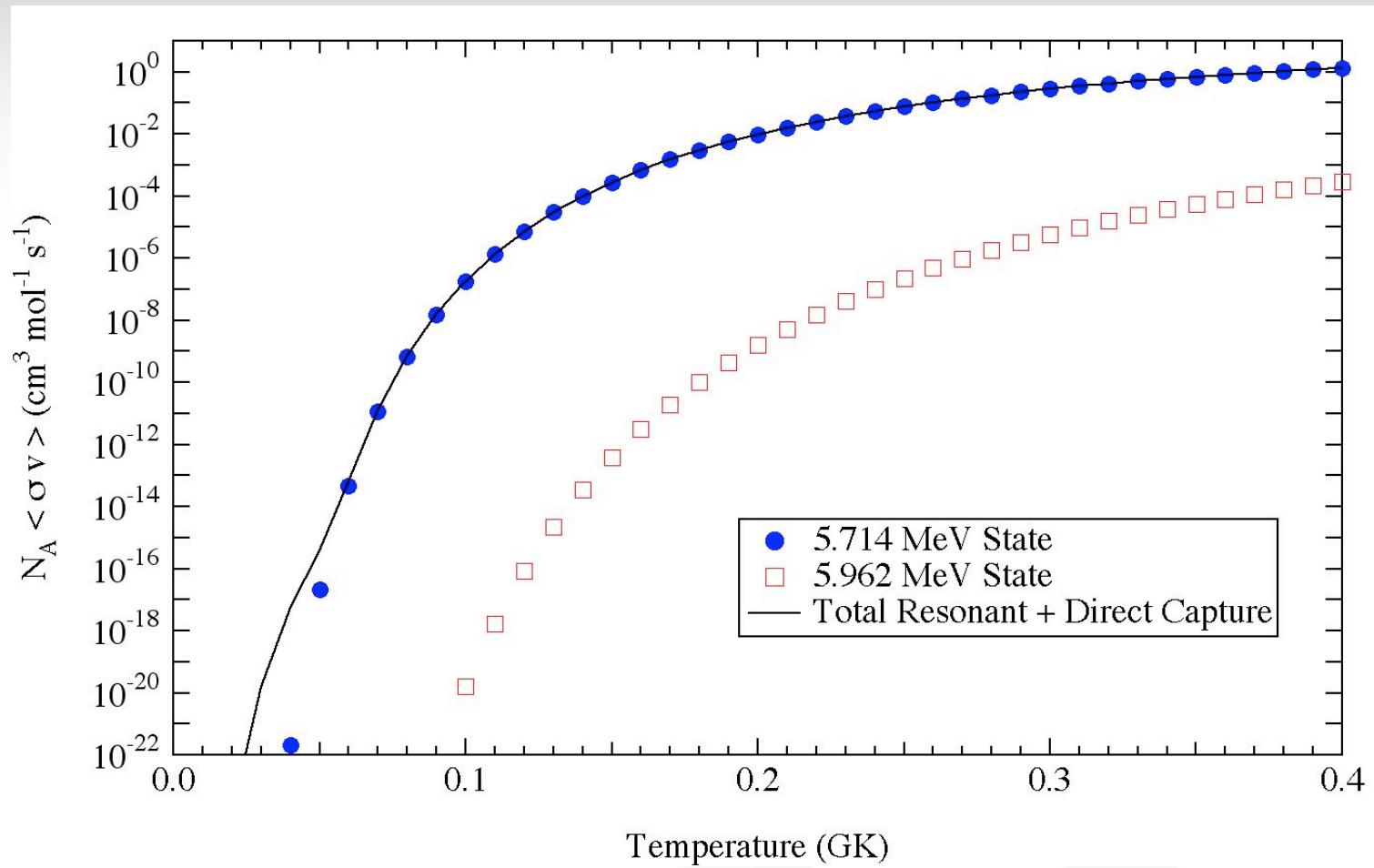
Branching ratio data



Decay widths and resonance strengths

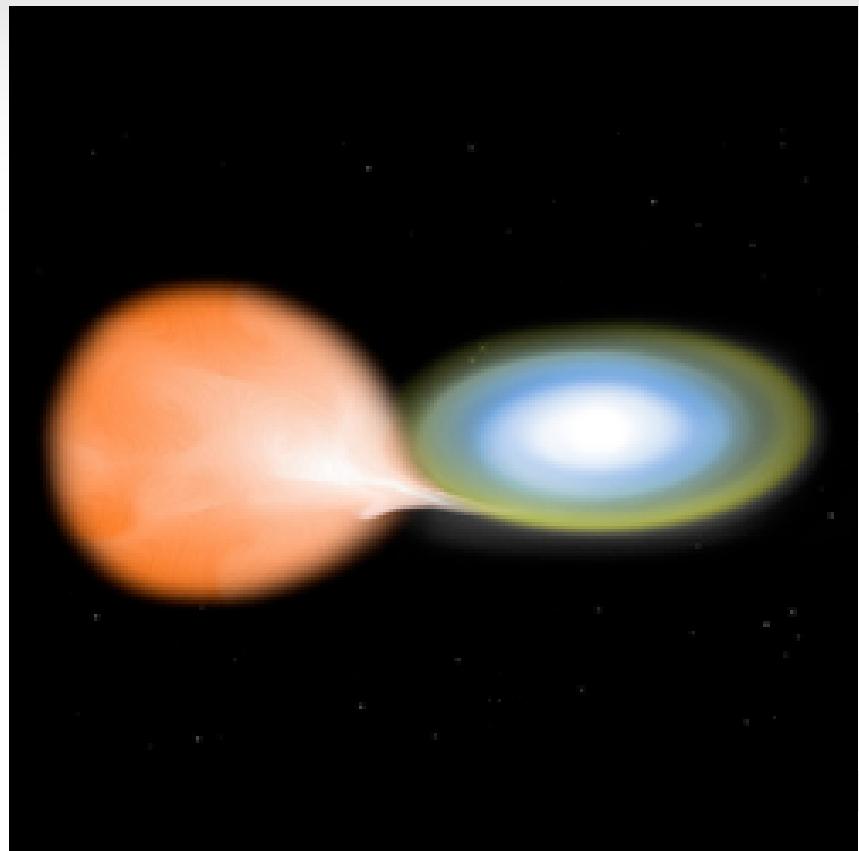
Excitation Energy (MeV)	B _p	Γ_{tot} (meV)	Γ (meV)	Γ_{tot} (meV)
5.714	≤ 0.020		16 (+50, -7)	≤ 0.80
5.962	0.98 ± 0.01	2 (+5, -1)		0.2 (+0.6, -0.1)
6.046	0.97 ± 0.03	2 (+2, -1)		0.7 (+0.8, -0.3)

Astrophysical reaction rate



Summary

- Measured proton-decay branching ratios of states in ^{22}Mg
- Combining with radiative widths, deduced astrophysical rate of $^{21}\text{Na}(\text{p},\gamma)^{22}\text{Mg}$ reaction
- Results consistent with direct measurement at TRIUMF
- Compatible with CGRO upper limits



Collaborators

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